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Development and psychometric validation of the 'Parent Perspective University of Rhode Island Change Assessment-Short' (PURICA-S) Questionnaire for the application in parents of children with overweight and obesity

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ABSTRACT

Introduction: High prevalence rates of childhood obesity urgently call for improved effectiveness of intervention programmes for affected children and their families. One promising attempt can be seen in tailoring interventions according to the motivational stages of parents as 'agents of change' for their children. Evidence from other behavioural contexts (eg, addiction) clearly shows the superiority of motivational-stage dependent tailored (behavioural) interventions. For the time-efficient assessment of motivational stages of change, this study aims to develop and psychometrically validate a 'Parent Perspective Version' of the existing University of Rhode Island Change Assessment-Short, an instrument assessing the motivational stages based on the theoretical fundamentals of the Transtheoretical Model of Psychotherapy.

Methods and analysis: In a multistep Delphi procedure, involving experts from the study context, the original items of the University of Rhode Island Change Assessment-Short Questionnaire will be transformed from the 'self-perspective' ('I am having a problem') to the parent perspective ('my child is having a problem'). Following item adaptation, the new version of the questionnaire will be psychometrically validated in a cohort of N=300 parents with overweight or obese children. Parents will be recruited within a multicentre and multisite approach involving private paediatric practices, specialised outpatient clinics as well as inpatient and rehabilitation sites. Analyses will include confirmatory factor analyses, internal consistencies (reliability) as well as convergent and criterion validity. Convergent validity will be analysed using subscales of the HAKEMP-90 Questionnaire, an instrument which has been shown to differentiate between 'state' and 'action' orientation of individuals.

Ethics and dissemination: This study has been granted ethics committee approval by the University of Tuebingen (number 644/2014BO2). The results of this study will be released to the participating study centres and will be submitted to peer-reviewed journals and presented at international conferences.

Trial registration number: VfD_PURICA-S_15_003607.

Strengths and limitations of this study

- Development of a parent perspective of the University of Rhode Island Change Assessment-Short using an innovative Delphi method for the adaption of perspective of the questionnaire items.
- The sample is recruited in a variety of study centres all over Germany including outpatient paediatric practices (urban and rural, with and without specialisation in obesity), paediatric departments of hospitals, rehabilitation clinics and tertiary university centres.
- This will enable tailoring of respective interventions according to motivational stages of parents as 'agents of change' for their children who are overweight or with obesity.
- Since the Parent Perspective University of Rhode Island Change Assessment-Short (PURICA-S) is a disorder-unspecific instrument, it can easily be transferred to other entities, so it will also be possible to validate/use the PURICA-S for parents with children suffering from other chronic conditions such as asthma and diabetes.

INTRODUCTION

High prevalence rates of childhood obesity and associated diseases challenge healthcare systems in high and middle-income countries.[1–3] The prevalence rates for overweight and obesity in infancy and adolescence in Germany has doubled since the 1980s. Today, about 1.9 million children and adolescents in Germany suffer from being overweight or obese.[2] At the same time, efficacy and efficiency of existing intervention programmes seem to be limited.[4 5] Possible explanations according to Böhler *et al*[4] are high dropout and relapse rates. On the other hand, studies show the advantage of family-based interventions for overweight and obese children[6 7] (for a meta-analysis[8]) and they emphasise the necessity of involving the parents of affected children and adolescents in interventions. The scientific statement of the American Heart Association concerning the treatment of obese children, specifically calls for the involvement of parents of affected children as 'agents of change' in behavioural and environmental interventions.[9] Given the high dropout and relapse rates of existing intervention programmes, it can be hypothesised that interventions need to be tailored to the individual motivational stages of change of the parents involved.

A well-established conceptual model that represents different motivational stages is the Transtheoretical Model (TTM) by Prochaska and DiClemente.[10] It originally postulates five different motivational stages (or stages of change; SoC) a person might be in: in the 'precontemplation stage' there is no awareness and intention of changing problematic behaviour, in the 'contemplation stage' there is an awareness of problematic behaviour and an intention to change it but no adequate action taken, in the 'preparation stage' there is an intention to change problematic behaviour and a commitment to do so in the near future, in the 'action stage' there is an active effort to change problematic behaviour. In the 'maintenance stage' problematic behaviour has been changed and there is now an effort to maintain these changes. According to Prochaska, Norcross and DiClemente,[11] changes in attitude and behaviour through these five stages do not follow a linear progression from one stage to another but spiral up the different stages. So there is successive progress from one stage to another but there is always the possibility for retention to a previous stage. Most instruments that operationalise SoC use only the precontemplation, contemplation, action and maintenance stages.[12] See figure 1 for an illustration of these four stages.

The determination of a person's SoC is especially relevant for disorders with a behavioural dimension (eg, addiction, eating and weight disorders) and chronic impairments of health with related behavioural dimensions (eg, asthma, diabetes and others).[13 14] Existing evidence suggests that motivational stage adapted interventions are significantly more effective than interventions not specifically addressing the SoC of an individual.[13–17] Several well-conducted meta-analyses report the superiority of SoC-specific interventions.[13 16] Krebs *et al* (2010) for example, found significant effects of SoC-specific interventions concerning food habits and physical activity with up to 39% difference in outcomes compared to the control condition. On the other hand, there are systematic summaries that did not find an advantage of tailored interventions. Cahill *et al*[18] could not find any advantage or disadvantage of, for example, motivational stage based self-help interventions for smoking cessation in their Cochrane Review in comparison with a standard not-tailored intervention. However, they also conclude that the current evidence base is largely underpowered which complicates robust conclusions to date. Furthermore, the included studies focus on expert systems, self-help interventions and individual counselling whereas no conclusions could be drawn for other types of stage-based interventions by professional agents, for example, physicians, which seems especially important in the primary care of clients who are overweight and with obesity. Another systematic review by Bridle *et al*[19] investigated the effectiveness of health-behaviour interventions specifically based on the TTM, again finding only limited evidence in favour of the effectiveness of stage-based interventions. However, one of the major concerns with the studies included, as pointed out by the authors, is that only few studies used validated and established instruments for assessing SoC.

In the context of overweight and obesity in childhood, by addressing an individual motivational stage, parents could be influenced to use healthcare programmes and interventions more frequently and more persistently and may prevent dropout. We therefore aim to develop and validate an instrument to determine different stages of motivation of parents with overweight or obese children.

There has been some research into the field of childhood obesity, the TTM and associated development of instruments, notably the 'Family Stage of Change (FSOC) Tool'[20] and the 'Dietary and Exercise Stage of Change' tool[21] that has been used once before to assess parents' SoC.[22] Different from what we are trying to achieve in this study, the FSOC tool does not focus on the role of the parents as 'agents of change' for their children but assesses the families as a whole. Furthermore, the instrument was developed from the

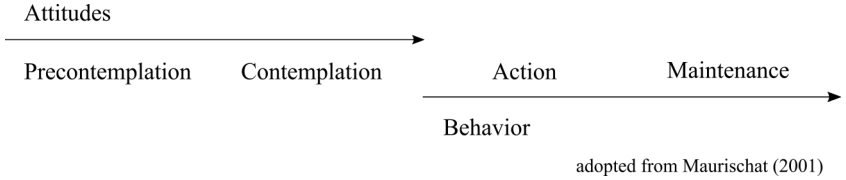

Figure 1 Aspects of attitude and behaviour according to the stages of change.

Family Nutrition and Physical Activity Screening Survey by taking those items that are specific to family behaviours, adapting them and applying a staging algorithm to them that DiClemente *et al*[23] originally used for smoking cessation in 1991. Finally, their instrument was only validated for children from preschool to middle school whereas we are developing an instrument for a broader population.

The 'Dietary and Exercise Stage of Change' tool on the other hand is a multi-item algorithm of SOC to assess an individuals' SoC and focuses on the advantages of an instrument for multiple target behaviours related to weight loss.[21] This instrument has been used by Sealy *et al* to assess parents' SoC for diet and physical activity of their children. The instrument however has been used on a very specific sample (children visiting a physical activity programme by an agency for socially disadvantaged children) and the authors themselves state that their study does not provide any evidence of the validity of the used measure.[22] It can therefore at most be seen as preliminary work for further development and validation of an instrument assessing the parents' SoC.

In the light of these lines of research from colleagues and our aim of developing an instrument to assess the motivation to change parents as 'agents of change', we decided on using a well-established instrument that is short, easy to handle and hence can be used in a variety of settings. A generic tool (versus an obesity specific one) is preferred since it enables its application for other conditions that entail motivational and behavioural aspects (eg, asthma or diabetes) and also constitutes a suitable instrument for further research and comparisons of parents' SoC of children with a variety of behavioural problems.

Several standardised instruments for assessing an individual's SoC concerning alteration of his or her own given behavioural (health-related) problem are available.[12] One of the most widely-used instruments to elicit the SoC is the University of Rhode Island Change Assessment (URICA).[24] URICA consists of four subscales for precontemplation, contemplation, action and maintenance with eight items, respectively. Scores are generated per person, one for each subscale. The factorial structure can be seen as good with factor loadings of $0.54 \leq \lambda \leq 0.82$ and with $0.88 \leq \alpha \leq 0.89$ the internal consistencies of the subscales show very good values.[24] The robust validity of the URICA and its qualities such as a predictor of, for example, clinical outcome parameters were confirmed in numerous studies.[25 26]

The new instrument will be developed on the basis of the existing short-form of the URICA, the URICA-S.[27] The URICA-S consists of 16 items with 4 items for each of the 4 subscales precontemplation, contemplation, action and maintenance. It has been validated, for example, for patients with depression, somatoform disorders and eating disorders and has consistently shown sufficient to excellent internal consistencies of the four factors.

Apart from the general (multipurpose) version of the URICA-questionnaire a variety of adaptions for specific groups, notably for the field of eating disorders have been developed.[28–32] However, to the best of our knowledge, to date no questionnaire assessing the SoC of parents as agents of change for their affected children has been developed and sufficiently validated.

Such an instrument, however, will be necessary for the valid assessment of the Stages of Change of parents with overweight or obese children within tailored intervention programmes, specifically addressing the motivational stage of parents. Hence, this study aims to develop and psychometrically validate a questionnaire to elicit the Stage of Change of parents with overweight or obese children.

METHODS AND ANALYSIS

Adaption of perspective

The adaptation of individual items from the individual perspective ("I am having a problem…") of the existing URICA-S to the parental perspective ("my child has a problem") of the Parent Perspective University of Rhode Island Change Assessment-Short (PURICA-S) will be administered using the Delphi method,[33] for example,[34] involving six highly experienced experts with diverse backgrounds relevant to the field (eg, Paediatrics, Linguistics, Statistics and Psychology). The process of item-adaptation comprises a total of six developmental steps. Steps 1 and 2 describe the development of instructions for adapting the items and steps 3–6 describe the Delphi method. *Step 1*: The instructions for the experts participating in the Delphi procedure are developed in a group discussion within the study team (FJ, KZ, JM, PM, KEG, MT, SZ and SE). Two separate groups independently develop instructions based on an initial brainstorming phase. These drafts are subsequently discussed in the whole group of the study team and one final draft is prepared for pilot testing. *Step 2*: The instruction for the experts for adapting the items to the new parental perspective are piloted by three experienced colleagues regarding comprehensibility and feasibility using the 'think aloud' technique.[35] The pilot participants are instructed to read the instructions and verbally state what they think the instructions are and how they would adapt four exemplary items of the URICA-S according to this instruction. They are also asked to write down their adapted items. The discussed topics are recorded and stored for use for a revision of the instructions by the study team if necessary. *Step 3*: Once the instruction has been finalised, it is circulated together with the original items of the URICA-S to the participating experts for the adaptation of the original items to the new perspective. Each of the experts thereby adapts the items of the URICA-S from the pre-existing (individual-) perspective to a parental perspective while maintaining the gist of the items. This first step of the Delphi process[36] will result in a collection of suggestions that are discussed in

our team and narrowed down ideally to not more than two versions per item. These two versions are then circulated again to the participating experts in Step 4. *Step 4*: The same experts are sent the proposed item versions to rate on a 5-point Likert scale with regard to their meaning apart from the perspective (1—no conformity with regard to contents, 5—total conformity with regard to contents). Experts are asked to comment on an item-proposal if they give a rating of lower than three. For the item-rating template, see figure 2.

Step 5: The results of the expert ratings are analysed by the study team. For all items with at least one version with a mean ≥3, the item-version with the highest mean is included in the final version of the questionnaire. All item-versions with a mean lower than three are revised by the study team (under consideration of the comments by experts from step 4). *Step 6*: The revised items are resent to the experts for conformity ratings again. Steps 5 and 6 are repeated until all of the items show a mean ≥4 and are then included in the final version of the new questionnaire.

For a flow diagram of the study, see figure 3.

Validation questionnaire

Following a detailed study information sheet (approved by the Ethics committee of the University of Tuebingen Medical Faculty) participants will be presented the study-questionnaire for the validation of PURICA-S which comprises the following dimensions/items (1) comprehensive demographic information for sample description, (2) validated figures (filled in by staff at the recruiting centre) for age, height, weight and BMI-centile of the affected child, (3) the newly adapted items of the PURICA-S (see online supplementary file 1), (4) a standard instrument to assess general aspects of everyday life of the affected child (as eg, activity levels) (KiGGS)[2] (5) the Action Control Scale (ASC-90; German HAKEMP-90) for construct validity, (6) modules of the German version of the Patient Health Questionnaire (PHQ)[37] to elicit perceived stress and symptoms of depression and anxiety of study participants (as potential confounders for motivational stages), (7) items to elicit problem awareness of parents with questions such as: 'do you think your child is overweight?' answered on a five-point Likert-scale ranging from 'not at all' to 'yes, certainly'), past usage of information and health services regarding childhood obesity respectively (for criterion validity). Exemplary questions here include "have you ever looked out for information on childhood obesity?" If 'yes', (1) how often in the past 6 months and (2) where? (with multiple choice options: Internet, Print Media, Television, etc).

Study centres

The validation study is carried out as a multicentre study with 23 different trial sites across Germany. Parents of obesity affected children and adolescents are recruited in 16 outpatient paediatric practices (urban and rural, and with and without specialisation in obesity) and in seven paediatric departments of hospitals, rehabilitation clinics and tertiary university centres (Berlin, Bremen, Datteln, Dortmund, Stuttgart, Sylt and Ulm).

Sample

All parents who present themselves with their children to one of the cooperating facilities during the study period (autumn 2016 to spring 2017) are invited to participate in the study with the aim of recruiting ~300 study participants. Participating parents are required to have at least one child between the age of 2 and 18 years who had a body mass index (BMI) >90th centile for population-specific percentiles according to German guidelines.[38 39] The BMI has to be been determined in a validated measuring fashion (eg, in a paediatrician practice or similar facility) within the past 12 months.

For a description of the participating parents, gender, height, weight (BMI), level of education, level of physical activity and potentially overweight and obesity associated physical disorders (eg, diabetes, hypertension) as well as perceived stress, symptoms of anxiety and depression (according to the PHQ-D subscales, respectively) are assessed.

Sample size calculation

There are no gold-standard recommendations concerning quantitative methods for planning sample sizes for confirmatory factor analyses. The available suggestions, for example, comprise those of Field,[40] who recommends a sample size of ~100 participants as a general rule for sample size for exploratory and confirmatory factor analyses. The 'rule of thumb' measure with the

Item 3	Formulation	Rating by experts	
original item (self-perspective)	"I am doing something about the problems that had been bothering me."	no conformity with regards to content	total conformity with regards to content
original item (parental perspective)	"I am doing something about the problems that had been bothering my child."	① ② ③ ④ ⑤	
comments			

Figure 2 Template for the item-rating by experts within the Delphi-Procedure (step 4).

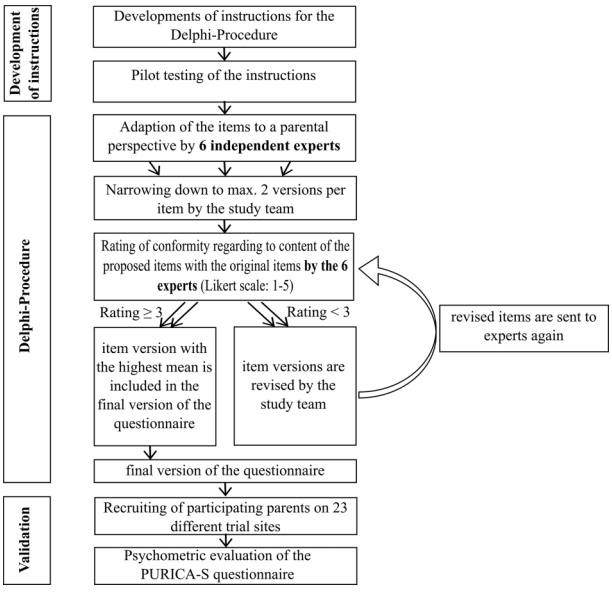

Figure 3 Flow diagram of the item adaption and psychometric evaluation of the PURICA-S.

highest sample size requirement recommended by experts recommends ~n=20 participants per item of the instrument that is to be validated. For the present study, the latter requirement would lead to a sample size of ~300 participants. The sample size of the validation study of the URICA-S[27] included n=125 participants for the exploratory and the confirmatory factor analysis, respectively. Given these considerations and in close consultation with the participating chair of clinical epidemiology and biometrics, the envisaged sample size is set at 300 participants. If both parents of one overweight or obesity affected child present at the study centre, the parent having relatively more daily contact with the child will be invited to fill in the questionnaire.

Study hypotheses

The adapted instrument to assess the motivational stages of change of parents with affected children (PURICA-S) shows the same factor structure (4 factors) as the original version (URICA-S); it shows comparable characteristics concerning reliability as well as relations for convergent and criterion validity in the expected direction.

Factor analysis

To test the study hypotheses confirmatory factor analyses will be conducted using URICA-S as a benchmark given that good and very good characteristics were confirmed for this version.[27] Maximum Likelihood Estimations are applied using Amos (SPSS V.19.0, IBM 2010). For the comparison of the observed structure of correlations with the benchmark factor model, we will use recommendations for confirmatory factor analysis according to Hu and Bentler:[41] the Comparative Fit Index should be at least 0.95, the Root Mean Square Error of Approximation ≤0.08 and the Standardised Root Mean Residual ≤0.11.

Reliability

Internal consistency will be used as a measure of reliability in this study. According to the polytope item structure of the tested instrument, internal consistency will be computed using Cronbach's α as a measure of the items' intercorrelations within the four subscales cf.[42] Since the instrument consists of only 16 items, Cronbach's α is a sufficiently conservative criterion for internal consistency cf.[43] In this study means of Cronbach's α >0.6 are considered acceptable, α >0.7 as good, α >0.8 as very good and α >0.9 as excellent.

Validity

Validity will be assessed in the following dimensions (1) convergent validity and (2) criterion validity.

Convergent validity

To evaluate convergent validity of the PURICA-S we will use two subscales of the Action Control Scale (ASC-90; German HAKEMP-90) which is an instrument to assess action or state orientation (scale Action orientation subsequent to failure; AOF) and prospective and decision-related action or state orientation (scale Prospective and decision-related action orientation; AOD).[44 45] The factorial structure, aside from few exceptions, can be seen as sufficient to good with factor loadings of $0.22 \leq \lambda \leq 0.68$ and with $0.70 \leq \alpha \leq 0.81$ the internal consistencies of the subscales show good to very good values.[44] It has been shown that the scales AOF and AOD measure comparable constructs to the stages of change of the TTM. For the AOD scale especially, it is well established that it moderates the relation between formation of intention (cf. contemplation) and action.[44 46 47] Therefore, this instrument can be seen as suitable to differentiate the contemplation from the actions subscales of the PURICA-S and will therefore be used to evaluate this important motivational stage transition.

Criterion validity

To assess criterion validity, the dimensions 'problem awareness' and 'usage of information, consultation and therapy concerning childhood overweight or obesity' are assessed. We expect direct relations of these criterion-dimensions, especially for the transition from stage 1 (precontemplation) to stage 2 (contemplation) and to stage 3 (action). Since problem awareness is the key difference between stages 1 and 2 it seems particularly suitable to assess criterion validity. *U*sage of information and consultation and therapy distinguish especially between the stages of contemplation (awareness of a problem but no action taken) and action (active effort to change problematic behaviour) and are therefore assumed to be a suitable measure for criterion validity.

Further items to assess criterion validity are adopted, for example, from the KiGGS study[2] that contains items

which measure behavioural risk factors and protective factors for example, concerning media consumption (time spent on eg television or online media) and physical activity, which are assumed to be less frequent in latter stages of change than early stages. Also educational background and for an exploratory inspection family history of overweight and migration status are collected. Potentially obesity-associated disorders (diabetes, hypertension, cardiac infarction) are also assessed for criterion validity. For the individual hypotheses of the direction of correlations between the individual variables, see the nomological network in table 1.

ETHICS AND DISSEMINATION

This study will be conducted according to the Declaration of Helsinki and has been granted ethics committee approval by the University of Tuebingen (number 644/2014BO2). Since the questionnaire will be filled out completely anonymously by adults, no written consent by the participants will be obtained and filling in a questionnaire is seen as consent to participate in the study. Parents will be given a Participant information sheet about the purpose of the study with contact information of the study team in case of any further questions.

The results of this study will be released to the participating study centres and will be submitted to peer-reviewed journals and presented at international conferences. The data set resulting from this study will be available online as a 'scientific use file' following completion of primary analyses as described in this study protocol.

DISCUSSION

This study aims to develop and validate an instrument for assessing the motivational stages of change of parents with overweight or obese children. Such an instrument is needed to tailor respective interventions to the parental role as 'agents of change' for their affected children. Tailoring interventions to tackle overweight and obesity in children (and adolescents) according to the individual motivational stage of parents, promises higher efficacy, for example, through more successful interventions, reduced dropout rates and diminishing relapse-rates.[13–17]

After a successful validation, we plan to use PURICA-S, for example, within the context of a stepped-care model for the treatment of overweight and obese children. We aim to specifically tailor the materials and behavioural interventions for counselling and treatment modules alongside the motivational stages of change of involved parents (and adolescents), for example, using techniques of motivational interviewing.[48]

Since PURICA-S is a disorder-unspecific instrument, which can easily be transferred to other entities as well, it will also be possible to validate/use PURICA-S for parents with children suffering from other chronic conditions such as asthma and diabetes.

Trial status

The Delphi process for the adaption of the items and the rating by the experts concerning conformity with regard to contents of the adapted item versions to the original item versions were completed between November 2015 and April 2016. The resulting questionnaire is currently in print and will be ready to be sent out to the

Table 1 Nomological network for the validation of the PURICA-S

Subscales PURICA-S	Stage 1 Precontemplation	Stage 2 Contemplation	Stage 3 Action	Stage 4 Maintenance
Dimensions				
Convergent validity				
ACS 90 subscale AOF	−−	−/+	++	++
ACS 90 subscale AOD	−−	−/+	++	++
Criterion validity				
Problem awareness	−−	−/+	+	++
Utilisation of information	−−	−/+	+	++
Utilisation of services/counselling	−−	−/+	+	++
Severity of child overweight (BMI centile)	++	+	+/−	−−
Media consumption child	++	+	+/−	−−
Physical activity child	−−	−−	−/+	++

ACS 90 subscales AOF and AOD: higher values on these scales are supposed to positively correlate with stages 3 and 4 (AOD) and stage 2 (AOF).
Problem awareness: positive correlation of high problem awareness scores with stages 2, 3, 4. Usage of information and of services/counselling: positive correlation with stages 3 and 4; severity of child overweight: complex relation to the stages of change (parents of highly obese children may be more motivated for change), however a positive correlation of weight and stages 1 (and 2) is assumed.
Media consumption: a lot of media consumption (hour/day) is supposed to positively correlate with stages 1 (and 2) and vice versa for stages 3 and 4.
Movement behaviour: a lot of movement (hour/day) is supposed to positively correlate with stages 3 (and 4) and vice versa for stages 1 and 2.
ACS, Action Control Scale; AOD, prospective and decision-related action; AOF, action orientation subsequent to failure; BMI, body mass index; PURICA-S, Parent Perspective University of Rhode Island Change Assessment-Short.

participating study centres. Data collection will occur between June 2016 and December 2017. For this study protocol, the German PURICA-S items were translated into English using the forward–backward translation method and are included in online supplementary file 1.

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Contributors All authors critically and substantially revised the manuscript and have given their final approval of the current version of the study protocol to be submitted for publication. FJ, KZ, JM, PM, KEG, MT, SZ and SE developed the instructions for the Delphi procedure. PM substantially contributed to the analysis plan of the study. CD, TRei, MW, SW and TRen are study managers at their respective study centre and all have made substantial contributions to the acquisition of data. All authors contributed to the study design and implementation methods.

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Ethics approval University of Tuebingen.

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Data sharing statement The data set resulting from this study will be available online as a 'scientific use file' following completion of primary analyses as described in this study protocol.

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